



Indian Institute of Information Technology

Allahabad

1. **Name of the Course:** Univariate and Multivariable Calculus

2. **LTP structure of the course:** 3-1-0

3. **Objective of the course:** Develop a solid understanding of infinite sequences and series, understand the concept of limit, continuity and differentiability of functions of single and multivariable, understand partial derivatives, directional derivatives of several variable function, rectangular, cylindrical and spherical coordinates systems, Multiple integrals, vector fields.

4. **Outcome of the course:** To Compute limits and derivatives of functions, Apply the Fundamental Theorem of Calculus, Distinguish between the concepts of sequence and series, and determine limits of sequences and convergence and approximate sums of series, and define, differentiate, and integrate functions represented using power series expansions, including Taylor series, Compute limits and derivatives of functions of two and three variables, solve constraint problems using Lagrange multipliers, Evaluate double and triple integrals for area and volume.

Component	Unit	Topics for Coverage
Component 1	Unit 1	The Real Number System, Convergence of a Sequence, Monotone Sequences, Cauchy Criterion, Bolzano-Weierstrass Theorem, Continuity and Limits, Existence of Maxima, Intermediate Value Property, Differentiability, Mean Value Theorem, Sufficient Conditions for Local Maximum, Point of Inflection
	Unit 2	Taylor's Theorem, Infinite Series, Convergence Tests, Leibniz's Theorem, Power Series, Taylor Series, Riemann Integration, Fundamental Theorems of Calculus, Riemann Sum, Improper Integrals, Area Between Two Curves, Polar Coordinates, Volume of Solids, Length of a plane curve, Areas of Surfaces of Revolution, Calculus of Vector Valued Functions
Component 2	Unit 3	Functions of Several Variables, Directional Derivatives, Gradient, MVT, Maxima, Minima, Second Derivative Test, Lagrange Multiplier Method
	Unit 4	Multiple integrals, Line and Surface integrals, Green's Theorem, Stokes' Theorem, The Divergence Theorem

6. **Text Book:** G. B. Thomas, M. D. Weir, J. Hass, and F. Giordano, Thomas' Calculus, Pearson.

7. **References Books:**

i) T. M. Apostol, Calculus, Vol. 1, Wiley.

ii) T. M. Apostol, Calculus, Vol. 2, Wiley.